

The Nervous System

1. Structurally, the nervous system is made up of the brain and the cranial nerves coming off of it, as well as the spinal cord and the nerves coming off it.

These structures enable us to:

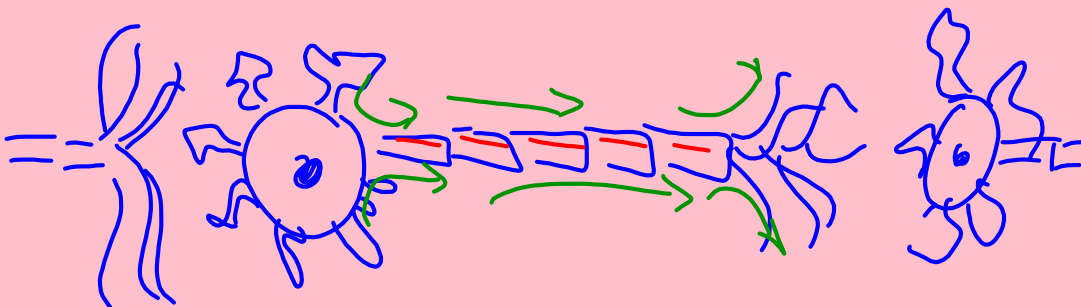
- a) Detect stimuli (sensory function using afferent neurons)
- b) Integrate sensory stimuli (integrative function)
- c) Respond to stimuli (motor function using efferent neurons)

2. The nervous system is organized into two subsystems:

- a) Central Nervous System
 - i. made up of the brain and the spinal cord
 - ii. integrates sensory information
 - iii. the source of all thoughts, emotions, and memories
- b) Peripheral Nervous System - consists of all the nerves coming off of the brain and spinal cord. It is made up of two subsystems:
 - i. somatic nervous system - nerves under conscious control *voluntary / skeletal*
 - ii. autonomic nervous system - functions independently and continuously without conscious effort. It is made up of: *involuntary / smooth cardiac glands*
 - a. parasympathetic - for everyday functions
 - b. sympathetic - fight or flight responses
 - c. enteric - the involuntary "brain of the gut"

3. There are two categories of cell types that make up all nervous tissue:

- a) Neurons - cell that transmit signals (nerve cells)
- b) Neuroglia - cells that take care of neurons (neurons are so highly specialized to relay electrochemical impulses, that they are incapable of doing much else)



4. Nerve Impulse - self-propagating electrochemical wave that travels along the neuron's cell membrane.

5. Synapse - the microscopic gap between an axon and a dendrite terminal

a) Neurotransmitter - chemical messengers that diffuse across the synapse to transmit the nervous impulse from one neuron to another

b) Neurotransmitters are produced by the end of an axon (axon terminal)

c) Drugs can modify the effects of neurotransmitters

d) Neurotransmitters can either

i. increase a signal (excitatory)

ii. decrease a signal (inhibitory)

iii. many axons touch the next neuron...if more

excitatory neurotransmitters are released than inhibitory , then the signal is relayed

6. Nerves - bundles of nerve cell extensions covered by an insulating layer. myelin sheath

There are three types:

① a) Sensory - afferent to the CNS
(some cranial nerves)

③ b) Motor - efferent to the CNS

(the nerves that move the eyes are the only

Inter neurons cranial nerves that are motor)

② c) Mixed - contain both sensory and motor fibers
(all of the spinal nerves and some cranial)

7. Reflex Arc - the simplest of nerve pathways

receptor → sensory (afferent) nerve fiber

sensory nerve fiber → interneuron (in the spinal cord) /brain

interneuron → motor neuron (efferent) nerve fiber

motor nerve fiber → effector (such as a gland or a muscle)

8. The Central Nervous System:

- a) Meninges - 3 layers of coverings of the brain and spinal cord
 - i. dura mater - the outermost layer; made up of tough C.T.
 - ii. arachnoid mater - middle meninges layer; thin and web-like; secretes cerebrospinal fluid
 - iii. pia mater - very thin, inner layer that is attached to the brain and spinal cord
- b) Contains white matter made up of axons insulated with myelin and gray matter made up of unmyelinated axons
- c) Spinal Cord
 - i. has 31 segments, each with a pair of spinal nerves
 - ii. gray matter is on the inside of the spinal cord and white matter is on the outside
 - iii. two major jobs:
 1. conduct nervous impulses (up/down)
 2. conduct reflexes (across)
- d) Brain
 - i. made up of about 100 billion neurons
 - ii. three structural regions:
 1. cerebrum - sensory and motor functions, memory, reasoning & emotions
 2. cerebellum - balance and coordination of voluntary muscles
 3. brain stem - regulates visceral activities and interconnects paths in the CNS.